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OIL DRILLING LAGS IN USSR

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With the increasing over-all volume of drilling work during the past few years, serious shortcomings have existed in the work of equipping the wells.

The chief of these shortcomings is poor organization of the well-construction cycle. The technical level and the organizational level of drilling work are out of balance, because re-equipping and improvements in the allied and supporting services have not kept pace during recent years with the technical reequipping of the basic drilling operations. Both the organization and the quality of service rendered to drilling operations have remained unchanged or, in some enterprises, have become worse. As a result, idle time, emergencies, etc. have consumed much of the over-all drilling time.

In 1954, drilling units were used in production at only 50 percent of their capacity. The remaining time of the calendar period was lost in idleness. Moreover, such unproductive time is tending to increase. In 1940, idleness, repairs, and the time required to deal with emergencies and complications accounted for 33.2 percent of the working period. In 1954, such losses of time were 1.5 times the 1940 figure. In fact, in 1954, the productive time was less than in 1950, and less than in the 1950-1953 average.

In 1954, idleness in drilling throughout the petroleum industry for organizational reasons reached a high of 15.3 percent for developmental drilling and 23.1 percent for prospect drilling. In the Azerbaydzhan SSR and the Tatar ASSR the percentages were even higher. In the Azerbaydzhan SSR idleness amounted to 10.4 percent for developmental drilling and 27.5 percent for prospect drilling, and in the Tatar ASSR 23.1 percent for developmental drilling and 31.6 percent for prospect drilling.

Emergencies and complications consume 16.2 percent of the over-all drilling period during developmental drilling and 20.1 percent during prospect drilling.

Commercial drilling speeds have remained very low and are far below the potential which new drilling methods and technology have provided for. In the past few years, they have risen somewhat in developmental drilling but have declined in prospect drilling. In 1954, the speed in prospect drilling was 83.3 percent of the average speed in 1940 and 96 percent of the speed in 1950. The speed of prospect drilling in 1954 throughout the Ministry of Petroleum Industry Azerbaydzhan SSR was half that of 1940 and 46 percent of that of 1950.

The introduction of heavier-duty drilling machines has made it possible to expand drilling work throughout the USSR, especially in the Ural-Volga regions. Three times as many drilling machines were employed in developmental drilling in 1954 as in 1940, and 5.5 times as many in prospect drilling. This made it possible to open a large number of highly important petroleum deposits.

A number of drilling agencies tried to fulfill their drilling quotas by employing a large number of machines rather than by improving their use. As a result, the coefficient of the number of drilling machines increased from between 1.6 and 1.7 to between 2.5 and 3.0, indicating that the drilling agencies have an oversupply of drilling equipment.

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The drilling agencies have the potential to raise both the numerical and qualitative indices. The large-scale introduction of turbodrilling and progressive drilling methods such as the incline-directional *[naklono-napravlenoye]*, the grouping of wells *[kustovoye]*, and re boring *[zareзка vtorogo stvola]*, plus the attainment of record drilling speeds by many drilling crews should readily make it possible to increase the commercial speed of drilling. To achieve this increase, however, considerable improvement will have to be made in the organization of drilling work.

The expansion of drilling work depends to a great extent on the operations of the allied and supporting agencies, whose tasks would increase with the expansion. However, these agencies have retarded the speed of drilling even at the present volume. They lag behind the drilling agencies because they are poorly equipped and because of the almost complete lack of mechanization in the more difficult operations.

The rig-assembling agencies have been slowing down the tempo of drilling for some time, leading to an irrational use of machines, prolonged interruptions, and crew idleness because of the lack of wells ready for drilling. Instead of the 10-18 days provided for in the plan, these agencies spend 25-30 days in erecting the rigs and assembling the equipment. The slowness has been due to poor mechanization and slow application of advanced methods for organizing crews.

Most of the oil well construction and assembly work is done by manual labor. Some 350 man-hours are spent monthly in readying work, in distribution of equipment and materials, and in preparing the sand and stone for one drilling job. Of this amount 300 hours, or 86 percent, involves manual labor and only 14 percent involves both machine and manual labor. In those cases where the readying work also involves sloping or clearing the tract of timber, the manual labor amounts to 90 percent or more. When derricks are constructed, including the readying work, all the earth-removing and concrete work is done by manual labor. The work of moving the derrick by dragging is mechanized only 20-30 percent, while the work of assembling the mechanical equipment is mechanized only 35-40 percent.

The more difficult and the manual work will have to be mechanized if labor productivity is to increase sharply and if the equipment of wells is to be accelerated. Mechanization can be accomplished only by a greater use of bulldozers, excavators, grading machines, travelling cranes, and other machinery.

According to the estimates made by TsIMTneft' (Central Institute for Mechanization) would triple the speed of manual-machine construction and assembly work and increase this speed by 2.5 times in the readying work. As a result, labor productivity could be increased at least 30 percent. This institute made a study of derrick assembly work and found that the reason it takes so long to erect derricks and assemble the equipment is because of the poor way the crews are organized.

In some drilling offices there are complex crews and, where such is the case, the rigs are erected much more rapidly. For instance, the drilling offices of the Kaganovichneft' and the Buzovnyneft' oil field administrations have derrick-assembling departments where complex crews are organized, and can construct and assemble a derrick in 7-8 days instead of 15-20 days which some other offices require.

Mechanization of the preparatory and derrick-assembling operations is contingent upon the proper use of erecting machinery and equipment and upon trained manpower. The drilling offices have the machinery but lack both the personnel trained in mechanization and the repair shops where the apparatus and spare

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parts could be repaired. According to data of TsIMNeft*, 100 drilling offices have 369 units of equipment (excavators, bulldozers, lifts, etc.) but they use this equipment only 10-20 percent beneficially. This machinery should be entrusted to some special agency, either an office or an administration, which would perform all difficult jobs by means of mechanized facilities. Even partial mechanization of the preparatory and derrick-assembling operations could replace some 500-600 workers in a single drilling trust.

Most of the drilling machines at present are concentrated in prospect drilling, but the work is poorly organized. The prospecting agencies have constantly increased the number of prospecting sites by deep-well drilling, but have failed to have the sites adequately prepared before drilling operations started. In most cases, the new sites were being drilled although there were no approaches or supply bases. Frequently the prospecting work was carried on with one or two drilling machines. As a result, it was several years before it was known if any oil had been found.

Prospect drilling has been prolonged for 4-6, and even 8, years in the Saratovskaya Oblast. Because of the lack of necessary equipment, the speed of drilling was extremely low, inasmuch as the drilling machines were idle more than half the time. The drilling agencies in this oblast are no exception, however.

The prospecting agencies of the petroleum industry endeavored to perform the maximum amount of deep drilling in the new structures and sites but they neglected to supply the expanding operations with the necessary material and technical resources. As a result, in 1954, the number of sites being prospected has risen to 420 percent of the number in 1940 and the opening of new deposits has been extended an average 4 years. In the Kuybyshevskaya Oblast and the Azerbaydzhan SSR the opening of new deposits was delayed 5-6 years.

Another shortcoming in the petroleum industry has been the combination of two completely different functions, that is, material and technical supply with drilling operations. This has been due to the poor operation of the supplying agencies. The material and technical supply agencies failed to establish bases and warehouses where the drilling agencies were operating and hence failed to supply the drilling agencies and prospecting sites with equipment and materials. As a result, the drilling agencies, which do not have their own transporting or supply facilities, have been forced to take time from their own work and divert drilling and derrick-assembling crews to the loading and unloading of materials. This has been standard practice in a number of drilling agencies.

In 1953, drilling crews lost 10.2 percent of the calendar period waiting for casing and drill pipe.

Considerable time has been lost because of the lack of mud solution and the necessity of preparing the solution at the sites by hand. Moreover, the poor quality of the solution has resulted only in complications and in the catching of tools. In the Azerbaydzhan SSR, a number of drilling offices spend as much as 20 percent of the total calendar period preparing and processing the mud solution and then dealing with the complications and emergencies which arise.

In most drilling offices, the drilled wells await the delivery of casing, compressor pump pipe, etc. This has been partially due to the artificial reduction in norms for supply of materials established for drilling offices.

The drilling trusts, in most cases, do not have their own facilities to haul freight to the wells and to the construction, nor assembly agencies responsible for equipping the areas being drilled. Both the trusts and the drilling offices must always depend for these services on other agencies which serve various, and in some cases unimportant, enterprises.

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Approximately 2,000 tons of freight must be hauled for a 2,000-meter well. This freight includes 265 tons of heavy items of up to about 20 tons, 350 tons of long material, 200 tons of loose material, 800 tons of clay, etc. To haul this freight on time and without interruption, the drilling agency should have its own tractors, trucks, and trailers.

At present, construction and assembly work in drilling operations is not fixed in the plan and there is no provision made for the maximum number or for materials. As a result, the oil fields and prospecting sites are equipped for 50-60 percent of the estimated volume of work. Prospect drilling is often started at new sites although there are no roads, supply bases, mechanical repair shops, or living quarters available. Drilling work is constantly interrupted, especially during the winter months.

Despite their importance, the drilling agencies still have not been established as full-fledged units capable of making their own decisions to meet their assignments.

Another shortcoming is the extremely large number of small drilling offices. These offices have four or five machines and drill some 10,000-20,000 meters annually. Because of their small size, they are neither able to use the machines to the best advantage nor to mechanize their work. In the drilling offices in general, there are some 10-15 different departments providing allied and supporting service to the offices.

Another question which must be solved is the testing of wells. Table 1 (below) shows that the drilling machines are held up for a considerable period of time during this stage of drilling operations.

The drilling machines in the Azerbaydzhan SSR remain idle during the period developmental wells are tested for a length of time equivalent to the actual time of drilling itself.

Eighty-one days were spent in 1953, on an average, to test prospect wells. In some regions the time consumed is 4-5, or even 6, months. If this problem is to be surmounted, specialized testing crews and departments will have to be organized in all the drilling offices. Moreover, the present practice of testing wells will have to be changed. Although it takes a long time to test one horizon, the same horizon is tested in the same site.

The reason for the inadequate drilling speeds is primarily the disproportion which has been developing as a result of the increase in mechanical speed and the reduction in the time the bit remains in the hole, thereby resulting in less depth cut by the bit. This can be seen in Table 2.

The relatively poor performance of the bit in the hole is a weak link in the drilling process. When the rotary method was being introduced into drilling operations, the increase in the speed of boring was hampered because the importance of the bit was underestimated. Although heavy-duty drilling units and turbine drilling are being introduced on a large scale, very little improvements are being made in the bit, precluding a possible increase in commercial speeds. The research agencies will have to improve the drilling bit if this problem is to be surmounted.

It is difficult to ascertain who in the Ministry of Petroleum Industry USSR is responsible for drilling operations. There are main administrations for petroleum production, for the gas industry, and for the construction of oil fields, but there is no administration or department within the ministry which would be responsible for drilling operations, their organization, economy, material and technical supply, etc.

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Economic research has fallen far behind in the petroleum industry. Under the present system, there is no assurance that any problems which might arise can readily be solved. Of the total number of scientific research workers in the industry, only 3 percent are engaged in solving economic problems.

Improvements in drilling operations can be made only by sharply increasing the mechanization of the more difficult, time-consuming work and by consolidating and reorganizing the servicing and supporting agencies.

Table 1. Percent of Drilling Period in 1953 Involved in Testing Wells

	<u>Developmental Drilling</u>	<u>Prospect Drilling</u>
Entire petroleum industry	50.4	31.2
Including Ministry of Petroleum Industry Azerbaydzhan SSR	100.7	65.5

Table 2. Mechanical Speeds and Depth Drilled by Bit

	<u>Mechanical Speed</u>		<u>Depth for Bit</u>	
	<u>Developmental Drilling</u>	<u>Prospect Drilling</u>	<u>Developmental Drilling</u>	<u>Prospect Drilling</u>
1940	2.08	1.26	33.4	19.6
1950	3.92	1.68	44.2	21.8
1953	6.19	2.57	35.8	18.7
1954 (first half)	6.77	2.87	33.7	18.7

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